Network Traffic Modelling and Router Performance Optimization Using Fuzzy Logic and Genetic Algorithms

BY

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THESIS

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I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis."

Zia A. Rahman
Sydney, Australia.

Abstract

Accurate computer network traffic models are required for many network tasks such as network analysis, performance optimization and areas of traffic engineering such as avoiding congestion or guaranteeing a specific quality of service (QoS) to an application. Existing traffic modelling techniques rely on precise mathematical analysis of extensive measured data such as packet arrival time, packet size and server-side or client-side round trip time. With the advent of high speed broadband networks, gathering an acceptable quantity of data needed for the precise representation of traffic is a difficult, time consuming, expensive and in some cases almost an impossible task. A possible alternative is to employ fuzzy logic based models which can represent processes characterized by imprecise data, which is generally easier to gather. The effectiveness of these models has been demonstrated in many industrial applications. This work develops fuzzy logic based traffic models using imprecise data sets that can be obtained realistically. Optimizing the performance of a router requires the optimization of a number of conflicting objectives. A possible approach is to express it as a multi-objective problem. Multi-objective evolutionary algorithms (MOEA) can be used for solving such problems. This research proposes two fuzzy logic based traffic models: fuzzy group model and fuzzy state model. These models together with MOEA are used to propose a simple and fast router buffer management scheme. The developed fuzzy group model includes a parameter which is also useful for measuring the irregular traffic patterns known as burstiness. The experimental results are promising.

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Dedicated to Ryan M Rahman
My only son (and sun)

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